Ministry of the Environment
125 Resources Road
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Etobicoke, ON M9P 3V6

Ontario

MEMORANDUM

October 16, 2007

To: Craig Kinch, District Manager (A)
Toronto District Office
Central Region

From: Gary DeBrou, Manager
Air Monitoring and Reporting Section
Environmental Monitoring and Reporting Branch (EMRB)

Re: Jones Auto Wreckers Fire Toronto 2007

Attached is a Technical Memorandum summarizing the results of a study examining the contaminant levels of local vegetation and soils near the site of a fire at Jones Auto Wreckers. The fire was located at 1 Thora Avenue in Toronto, Ontario and occurred on September 20, 2007. The study was done at the request of the Toronto District Office on the two days following the start of the fire, in parks and school yards in the vicinity of the smoke plume from the fire.

The study examined concentrations of organic and nonorganic (metals) concentrations found in vegetation, soil and playground play sand from public areas surrounding the fire location. Analyses were done for Polycyclic Aromatic Hydrocarbons (PAHs), dioxins and furans, and several metals, namely aluminum (Al), barium (Ba), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), strontium (Sr), vanadium (V) and zinc (Zn).

For further information regarding this study, please contact Dan Orr at (416) 327-4037.

Gary DeBrou

cc: Dan Orr, EMRB
Murray Dixon, EMRB
Randall Jones, EMRB

Ministry of the Environment

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Ontario

Technical Memorandum

Jones Auto Wreckers Fire
Toronto - 2007

Report No. S3328 - 2007
October, 2007

Ontario Ministry of the Environment
Environmental Monitoring and Reporting Branch
Air Monitoring and Reporting Section
Terrestrial Investigation Unit (Phytotoxicology)
125 Resources Rd., North Wing, 2nd floor
Toronto, Ontario M9P 3V6

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Introduction

On September 20, 2007 at approximately 2 pm, a five alarm fire broke out in the eastern end of the Jones Auto Wreckers yard located at 1 Thora Ave in the Danforth and Victoria Park area of Toronto. Residents from Thora Ave and Emmott Ave were evacuated as a precaution due to thick smoke from the fire at its peak. The fire was largely out by the following morning, however the fire department was continued to put water on hot spots until late in the afternoon of September 21, 2007. On September 21 the Terrestrial Assessment Unit, Environmental Monitoring and Reporting Branch of the Ministry of the Environment was requested to collect soil samples and tree foliage from schools and parks in the areas impacted by smoke from the fire.

Methods

On September 21 and 22, 2007 at the request of the Toronto District Office, the Terrestrial Assessment Unit collected soil and tree foliage samples from seven schools and playgrounds in the area impacted by the smoke from the Jones Auto Wreckers fire. A summary of the samples collected their location is presented in Table 1 and Figures A1 & A2. Control samples were collected from the Ashbridges Bay Park located 3.9 km upwind of the fire location. The sampling locations were based on modelling of the smoke plume path.

Table 1: Terrestrial Assessment Unit Sampling Sites, Jones Auto Wreckers Fire, September 21 & 22, 2007

Location	Station Number	Tree Foliage	Soil (cm)	Play Sand (cm)	Day	Distance (m)	Direction
Dentonia Park	1	Norway	0-2, 2-10	-	Friday	750	NW
Kenworthy Ave Park	2	Norway	0-2, 2-10	-	Friday	40	E
	3*	-	-	0-10	Friday	40	E
	4	-	-	0-10	Friday	40	E
	5*	-	0-10	-	Friday	40	E
Blantyre School	6	Ash	0-2, 2-10	0-10	Friday	600	SW
Lucy Ave Park	7	Norway	0-2, 2-10	0-10	Friday	120	WNW
Madelaine Ave Park	8	Norway	0-2, 2-10	-	Saturday	275	N
Donora Park	9	Red Maple	0-2, 2-10	-	Saturday	1400	NW
Selwyn School	10	Norway	0-2, 2-10	-	Saturday	2600	NW
Ashbridges Bay Park (control)	11	Norway	0-2, 2-10	0-10	Saturday	3900	SW

* - area affected by fire water runoff

At each location single surface soil and tree foliage samples were collected. If there was a play ground area in the park or school, single play sand samples were also collected. At each location except Kenworthy Ave Park, a single station was created to represent the soil, play sand and tree foliage samples. At Kenworthy Ave Park four stations were created because there were multiple soil sampling sites. Multiple soil samples were required at this location because fire water runoff had flooded parts of the park, necessitating representative samples to be taken from flooded and non flooded areas.

Digital photographs, sketch maps, GPS coordinates and written notes were taken at each of the sampling locations (see Appendix C). The GPS coordinates were taken using a Garmin Map 60Csx GPS unit placed at the centre of the five by five meter soil sampling location and consisted of the average of a minimum of 100 readings.

Soil Sampling

All soil and play sand samples were a composite of nine (9) soil cores taken from a five by five meter area. An Eijkelkamp gouge auger was used to take the soil cores. The individual core samples were placed in a stainless steel bowl, disaggregated, mixed and then sub sampled into

amber jars for organic analysis or polyethylene bags for metals analysis. All sampling equipment was cleaned between each sampling site. Soil cores were collected from two depths, 0 to 2 cm and 2 to 10 cm. As the play sand was very dry and loose making it difficult to sample, only a 0 to 10 cm depth was collected.

Foliage Sampling

Where possible, Norway maple trees were sampled as they are the most common tree in the area and they provide a large leaf surface area for soot to collect. If Norway maple was not present the most common tree at the site was substituted. Foliage samples were collected from the side of the tree facing the fire location from a height of 6 to 7 meters. At station 2, the trees were all young and samples were taken from a height of 3 to 4 meters. Two samples were collected for organic analysis and two samples were collected for inorganic (metals) analysis. Foliage samples for organic analysis consisted of approximately 15 to 20 leaves which were placed in amber jars. Foliage samples for inorganic analysis consisted of the leaves from four 40 cm long branches which were place in polyethylene bags. Of the two foliage samples collected for inorganic analysis, one sample was to be washed during sample preparation to remove surface particulate matter and the other sample was not to be washed during sample preparation.

All samples were collected according to standard Ministry sampling protocols [1].

Sample Processing

All of the soil samples were delivered to the Terrestrial Assessment Processing laboratory where they were air dried. The samples for metals analysis were further sieved, and ground according to standard operating procedures [2]. The prepared samples were delivered to the Laboratory Services Branch for analysis for Polycyclic Aromatic Hydrocarbons (PAHs), dioxins and furans, and aluminum (Al), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), magnesium (Mg), molybdenum (Mo), nickel (Ni), strontium (Sr), vanadium (V) and zinc (Zn). Only the 0 to 2 cm soil samples and the 0 to 10 cm play sand samples were submitted for PAH and dioxin and furan analysis.

Tree foliage samples for organics analysis were delivered directly to the Laboratory Services Branch for Polycyclic Aromatic Hydrocarbons (PAHs), dioxins and furans analysis. Tree foliage samples for metals analysis were delivered to the Terrestrial Assessment Processing laboratory for processing. The washed samples were washed with a soap solution and distilled water to remove surface particulates. All samples were then dried and ground according to standard operating procedures [3]. The prepared samples were delivered to the Laboratory Services Branch for analysis for aluminum (Al), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), magnesium (Mg), molybdenum (Mo), nickel (Ni), strontium (Sr), vanadium (V) and zinc (Zn).

Results

All results of the chemical analysis are given in Appendix B. The results for the soils metals analysis are given in Table B1. Results are expressed in µg/g dry weight (ppm). There were no exceedances of *Regulation 153/04 Table 1 Background Standards* or *Table 2 Generic Cleanup Standards* for metals at any of the locations sampled [4]. There were two samples that exceeded the Ontario Typical Range OTR_{98} guideline for calcium and strontium [5]. Refer to Appendix D,

E and F for details on the guidelines and standards used.

Results for the soil PAH analyses are given in Table B2. Results are expressed in ng/g dry weight (ppb). There were no exceedances of *Reg. 153/04 Table 1 Background Standards* or *Table 2* Generic Cleanup Standards for PAHs at any of the locations sampled.

Results for the soil dioxin and furans analysis are given in Table B3. Results are expressed in pg/g dry weight (ppt). There was one exceedance of *Reg. 153/04 Table 1 Background Standard* for dioxin TEQ at the control location and no exceedances of the *Table 2 Generic Cleanup Standards* for dioxin TEQ at any of the locations sampled.

The results for the metal analysis in tree foliage are given in Table B4. All results are expressed in µg/g dry weight (ppm). There are no MOE standards for metals in vegetation. There were no exceedances of the Upper Limit of Normal guidelines for metals in vegetation [6].

The results for the PAH analysis in tree foliage are given in Table B5. All results are expressed in ng/g wet weight (ppb). There are no MOE standards or guidelines for PAHs in vegetation.

The results for the dioxin and furan analysis in tree foliage are given in Table B6. All results are expressed in pg/g wet weight (ppt). There are no MOE standards or guidelines for dioxins and furans in vegetation.

Discussion

Tree Foliage

Due to the time of the year the trees at each location were in various stages of decline, making it difficult to diagnose pollution injury. No obvious visible air pollution-type injury symptoms were observed on tree foliage at any of the locations sampled. Injury typical of heat scorching was observed on one Norway maple and on tulip tree at the west end of Kenworthy Ave Park immediately adjacent the fire (Figure 1 and 2). Other trees adjacent to the two heat-scorched trees showed no signs of heat injury.

Figure 1: Heat scorch on Norway maple.

Figure 2: Heat scorch on tulip tree.

At each location the leaves were visually inspected for soot deposits and a gloved finger was run over the leaf surface and inspected for discolouration. Soot deposits were only observed at the Lucy Ave Park sampling location. The soot occurred as 0.5 to 1.0 mm diameter black spots on the upper surface of the leaves that could be easily rubbed off (Figure 3). The soot deposits were observed on the tree sampled as well as on shrubs and ornamental plants at adjacent houses. These deposits were observed as far as the Lucy Ave and Danforth Road intersection.

Figure 3: Soot deposits on Norway maple leaves at Lucy Ave Park, site 7.

There were no exceedances of the ULN Guidelines for any of the 18 metals analyzed for in any of the tree foliage samples. No pattern of decreasing metals concentration with increasing distance from the fire location was detected. There was little or no difference between the washed and not washed samples at each location. In general, the aluminum and iron concentrations were slightly higher in the not washed samples. This is expected as the washing removes the fine soil dust particles found on foliage. The only evidence of any impact of the fire was slightly higher lead concentrations in the foliage from Kenworthy Ave Park and Lucy Ave Park in the not washed samples. The lead concentrations were approximately twice that of the washed samples. The fire had no significant impact on metal concentrations in the tree foliage at the locations sampled.

There are no standards or guidelines for PAHs in vegetation. PAHs on tree foliage were found above analytical detection limits at five of the eleven sampling sites. At the Ashbridges Bay control site, the only PAH found was phenanthrene with a concentration 0.01 ng/g above the analytical detection limit. Phenathrene and fluoranthrene were the only PAHs reported for the Selwyn School site and again the concentrations were only slightly above the analytical detection limit. The Lucy Ave Park location had the highest concentrations of PAHs on tree foliage with twelve of the PAHs being over the detection limit. This was also the only site where soot deposits were observed. Kenworthy Ave Park had the second highest concentrations with six PAHs over the detection limit and Madelaine Ave Park had the third highest concentrations with only three PAHs over the detection limit. These are the three closest foliage sampling locations to the fire site.

The pattern of PAHs found was similar at all three of the highest sites. Phenanthrene had the highest concentration followed by fluoranthene and then pyrene, Figure 4.

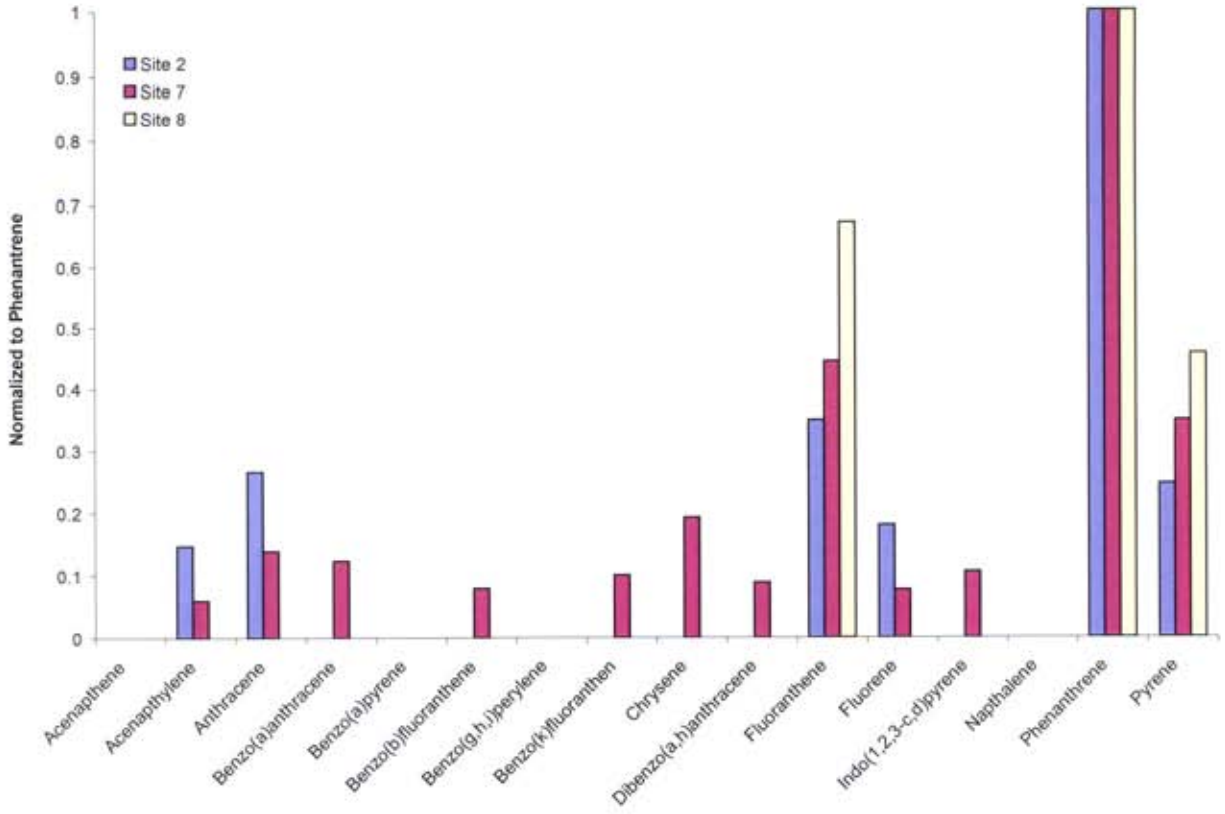

Figure 4: PAH concentrations on tree foliage, normalized to the phenanthrene concentration.

The actual concentrations of PAHs, where found, were low. The majority of the reported values are considered as trace amounts. Soot deposition from the fire has raised PAHs concentration in tree foliage at locations very close to the fire site but not to a significant degree.

There are no standards or guidelines for dioxins and furans in vegetation. The concentrations of dioxins and furans in tree foliage were all very low, with most results below the analytical detection limits. There is a pattern of slightly decreasing dioxin and furan concentration with increasing distance from the fire location. The highest concentration, TEQ of 1.5 pg/g, was found at the Lucy Ave Park with the next two highest at Kenworthy Ave Park and Madelaine Ave Park with TEQs of 0.45 and 0.44 pg/g respectively. The Lucy Ave Park was the only location where visible soot deposits were observed on tree foliage. All other locations are essentially at background concentrations ranging between 0.22 pg/g to 3.5 pg/g. Dioxin concentration in tree foliage is slightly elevated at locations very close to the fire site, reaching just above the background levels.

Soil

There were no exceedances of the Reg. 153/04 Table 1 or Table 2 standards for metals in soil or play sand at any location sampled. There was no pattern of decreasing concentration with increasing distance from the fire location. At the Kenworthy Ave Park locations, there was also no significant difference between the areas that had been flooded with fire water runoff and those that had not. Metals concentrations were generally lower in the play sand than the soil samples. The fire has had no significant impact on metal concentrations in the soils at the locations sampled.

There were no exceedances of the Reg. 153/04 Table 1 or Table 2 standards for PAHs in soil or play sand at any location sampled. While there appears to be a pattern of decreasing concentration of PAHs with increasing distance from the fire location, it is not consistent. The highest concentrations in play sand were at Lucy Ave Park, the closest down wind location, but the highest soil concentration were found at Madelaine Ave Park. The highest total PAH concentration was found at Blantyre school which was downwind of the fire and much further away than Lucy Ave Park, Kenworthy Ave Park or Madelaine Ave Park. The patterns of individual PAHs in the soil at each site, including the control, were similar in nature and did not match the pattern found on the tree foliage (see Figure 5). There was a small increase in PAH concentration in the play sand flooded by fire water runoff at Kenworthy Ave Park, which had a pattern similar to the tree foliage concentrations.

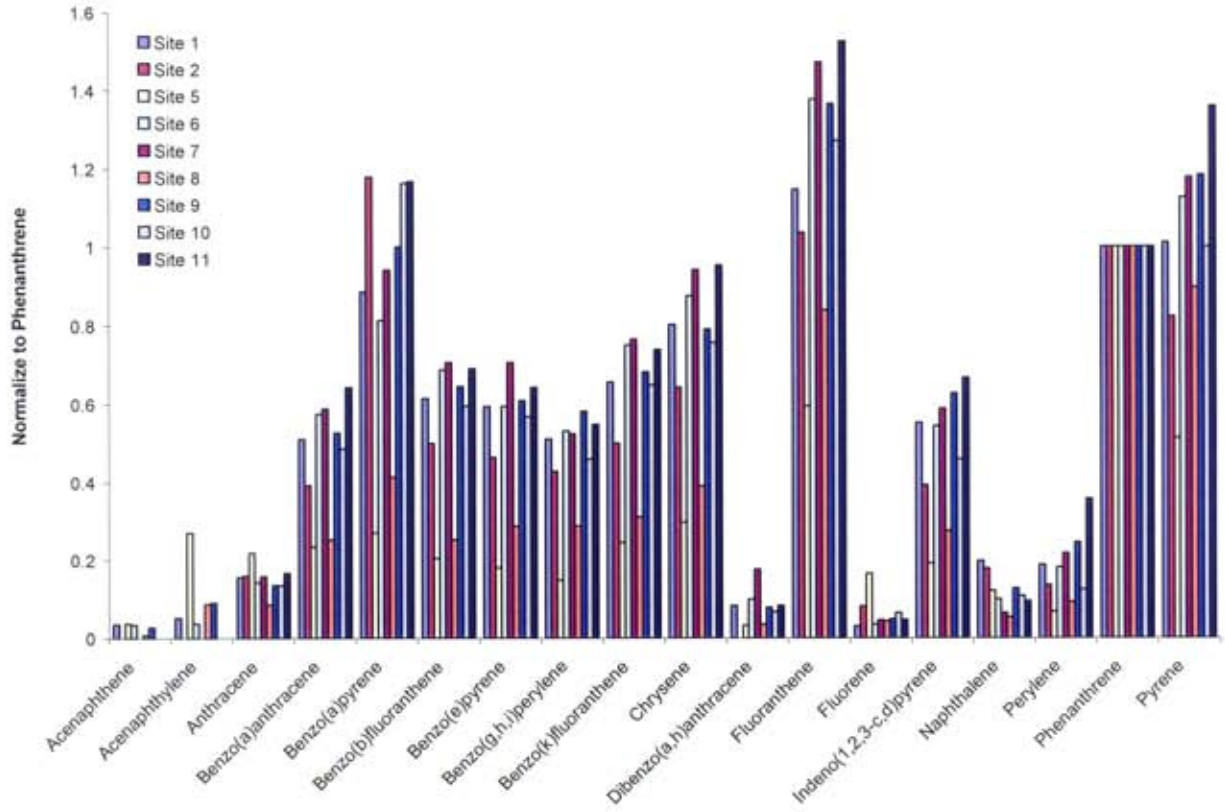

Figure 5: PAH concentrations in soil, normalized to the phenanthrene concentration.

Although the overall concentrations of PAHs found in soil were low, they were still significantly higher than the concentrations found on tree foliage. There was also an absence of a similar PAH pattern between soil and tree foliage. Together, these observations indicate that emissions from the fire had no significant impact on the PAH concentrations in the soil or play sand and the concentrations found were typical for an old urban area.

There were no exceedances of the Reg. 153/04 Table 1 or Table 2 standards for dioxin TEQ in soil or play sand at any location sampled. There was no pattern of decreasing dioxin TEQ concentration with increasing distance from the fire location. The highest dioxin TEQ concentrations were found at the Ashbridges Bay Park control location. At the Kenworthy Ave

Park locations there was also no significant difference in the dioxin TEQ concentrations between the areas that had been flooded with fire water runoff and those that had not. The congener pattern of dioxins and furans was consistent at all sites and was typical for soil. The fire has had no significant impact on the dioxin and furan concentrations in the soils at the locations sampled.

Conclusions

Tree foliage at the three closest sampling locations to the fire had low concentrations of PAHs and trace concentrations of dioxins and furans. Possible trace increases in lead concentrations were also found at the Lucy Ave Park directly downwind of the fire. This was also the only location where soot deposits from the fire were observed on vegetation.

There was no evidence of elevated concentrations of metals or dioxins and furans in surface soil at any of the ten schools or parks sampled in the vicinity of the fire. The only evidence of any impact of the fire on soil was very small trace amounts of PAHs in play sand in Kenworthy Ave Park where fire water runoff had flooded part of the playground area. None of the Ministry standards for soil were exceeded for any of the parameters measured.

Emissions from the fire at Jones Auto Wreckers, 1 Thora Ave, Toronto on September 20, 2007 had minimal impact on soil and vegetation at the ten locations sampled.

References

1. **MOE.** 1993. Field Investigation Manual Part 1: General Methodology. Phytotoxicology Section, Hazardous Contaminants Branch, Report Number HCB-014-3511-93.

2. **MOE.** 2000. Standard Operating Procedure for Processing of Soil Samples Prior to Analysis VS002. 5 pp.

3. **MOE.** 2000b. Standard Operating Procedure for Processing of Vegetation Samples Prior to Analysis VS001.

4. **MOE.** 2004. Soil, Ground Water and Sediment Standards for Use Under Part V.1 of the Environmental Protection Act. Ontario Ministry of the Environment. *O. Reg 153/04.*

5. **MOE.** 1993b. Ontario Typical Range of Chemical Parameters in Soil, Vegetation, Moss Bags and Snow. Phytotoxicology Section, Standards Development Branch, Report Number HCB-151-3512-93.

6. **MOE.** 1989. "Upper Limits of Normal" Contaminant Guidelines for Phytotoxicology Samples. Phytotoxicology Section, Air Resources Branch, Report Number ARB-138-88-Phyto, ISBN 0-7729-5143-8.

Appendix A: Maps

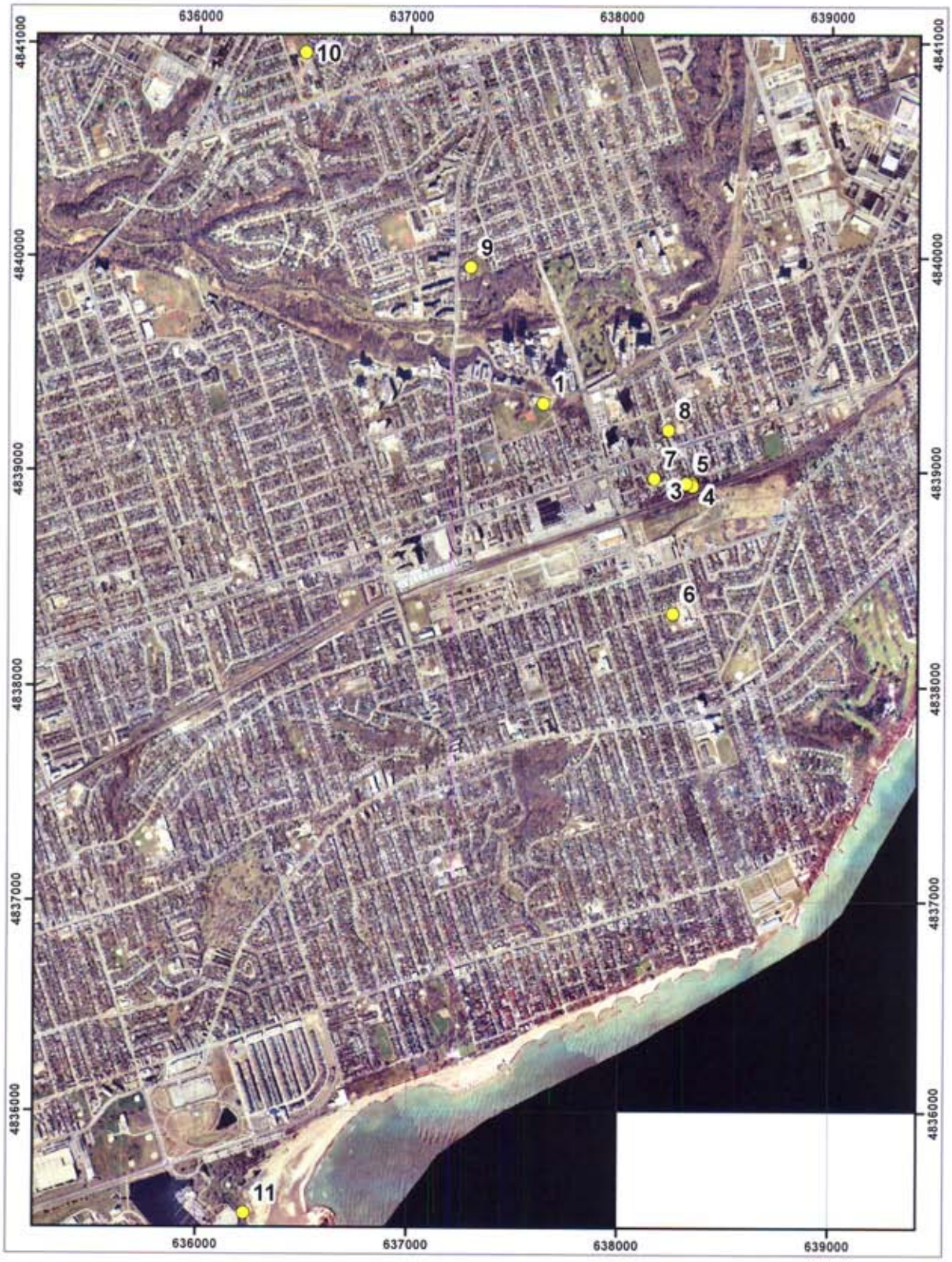

Figure A1: Soil and tree foliage sampling sites, September 21 & 22, 2007

Figure A2: Close in soil and tree foliage sampling sites, September 21 & 22, 2007

Appendix B: Results Tables

Table B1: Metals in soil from 7 schools and parks in the vicinity of the Jones Auto Wreckers fire, collected September 21 & 22, 2007

Location	Station	Depth	Type	Sample	Al	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Sr	V	Zn
Dentonia Park	1	0-2 cm	soil	2273	9600	67	0.5 <w	0.2 <w	19000	16	6.4	14	14000	27	4400	430	1.6 <t	12	34	26	59
		2-10 cm	soil	2274	11000	60	0.5 <w	0.3 <t	18000	18	6.7	14	16000	36	4700	440	0.5 <w	13	35	31	62
Kenworthy Ave Park	2	0-2 cm	soil	2279	9200	44	0.5 <w	0.2 <w	8700	13	4.3	9	14000	8 <t	2500	310	0.5 <w	8.7	21	28	63
		2-10 cm	soil	2280	11000	54	0.5 <w	0.2 <w	11000	17	5.9	10	17000	12	3700	460	0.5 <w	12	24	35	44
	3	0-10 cm	play sand	2281	2900	24	0.5 <w	0.2 <w	2500	11	5.1	8	28000	2 <w	1500	210	0.5 <w	6.4	5	66	20 <t
	4	0-10 cm	play sand	2282	3100	21	0.5 <w	0.2 <w	2600	12	5.8	7	29000	2 <w	1600	220	0.6 <t	6.7	6	69	19 <t
	5	0-10 cm	soil	2283	12000	67	0.5 <w	0.2 <w	7000	17	6.1	14	17000	12	3200	440	0.5 <w	12	20	33	59
Blantyre School	6	0-2 cm	soil	2288	5100	49	0.5 <w	0.3 <t	44000	10	3.6	20	10000	44	3800	240	0.5 <w	8.9	73	20	100
		2-10 cm	soil	2289	8000	71	0.5 <w	0.5 <t	29000	15	5.3	23	14000	92	3900	310	0.7 <t	13	61	28	150
		0-10 cm	play sand	2290	2600	15	1 <w	0.4 <w	*110000*	8 <t	3 <t	4 <t	14000	4 <w	4300	210	1 <w	4.6 <t	*160*	29	21 <t
Lucy Ave Park	7	0-2 cm	soil	2296	13000	62	0.5 <w	0.2 <w	16000	18	5.9	13	16000	12	4100	390	0.5 <w	13	32	31	54
		2-10 cm	soil	2297	13000	65	0.5 <w	0.3 <t	15000	19	6.3	12	17000	13	4000	400	0.5 <w	13	31	34	52
		0-10 cm	play sand	2295	2600	16	1 <w	0.4 <w	*100000*	9 <t	2.8 <t	5 <t	14000	6 <t	4900	210	1 <w	5.8	*160*	30	45 <t
Madelaine Ave Park	8	0-2 cm	soil	2302	10000	58	0.5 <w	0.2 <w	11000	17	5.7	12	15000	22	3600	360	0.5 <w	12	28	28	70
		2-10 cm	soil	2303	12000	64	0.5 <w	0.2 <w	12000	18	6.8	12	17000	21	3700	400	0.5 <w	13	30	33	63
Donora Park	9	0-2 cm	soil	2308	12000	60	0.5 <w	0.3 <t	10000	18	7	13	17000	19	3900	410	0.5 <w	14	25	33	47
		2-10 cm	soil	2309	12000	60	0.5 <w	0.3 <t	13000	18	6.5	13	17000	21	4000	420	0.5 <w	14	29	33	46
Selwyn School	10	0-2 cm	soil	2314	13000	65	0.5 <w	0.3 <t	14000	18	6.3	9	18000	9 <t	3900	450	0.5 <w	12	31	35	72
		2-10 cm	soil	2315	14000	73	0.6 <t	0.2 <w	36000	21	7.7	15	19000	13	6200	530	0.5 <w	16	63	37	53
Ashbridges Bay Park (control)	11	0-2 cm	soil	2320	3400	24	0.5 <w	0.2 <w	30000	7	2.5	6	6100	8 <t	2500	170	0.5 <w	4.8	48	11	26
		2-10 cm	soil	2321	7400	57	0.5 <w	0.3 <t	22000	15	4	13	12000	21	3400	290	0.5 <w	9.2	40	22	47
		0-10 cm	play sand	2322	2200	14	0.5 <w	0.2 <w	54000	13	3.3	3 <t	22000	9 <t	3200	230	0.5 <w	5.6	*86*	53	20 <t
Reg. 153/04 Table 1 Standards		(exceedences in **bold**)			ns	210	1.2	1	ns	71	21	85	ns	120	ns	ns	2.5	43	ns	91	150
Reg. 153/04 Table 2 Standards		(exceedences in **bold underline**)			ns	750	1.2	12	ns	750	40	225	ns	200	ns	ns	40	150	ns	200	600
OTR_{98} Guidelines		(exceedences in *italics*)			27000				58000				33000		16000	1300			78		

ns - no standard, <t - a measureable trace amount, interpret with caution, <w - no measureable response
all results are in µg/g dry weight

Table B2: PAHs in soil from 7 schools and parks in the vicinity of the Jones Auto Wreckers fire, collected September 21 & 22, 2007

Location	Station	Type	Depth	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
Dentonia Park	1	soil	0-2 cm	3.4 <t	5 <t	15 <t	49	85	59	57	49	63	77	8 <t	110	3 <t	53	19 <t	18 <t	96	97
Kenworthy Ave Park	2	soil	0-2 cm	2 <w	2 <w	4.5 <t	11 <t	33	14 <t	13 <t	12 <t	14 <t	18 <t	2 <w	29	2.3 <t	11 <t	5 <t	3.8 <t	28	23
	3	sand	0-10 cm	2 <w	2 <w	2 <w	2.3 <t	2 <w	2.2 <t	2 <w	2 <w	2 <w	3 <t	2 <w	6 <t	2 <w	2 <w	2 <w	2 <w	6 <t	6 <t
	4	sand	0-10 cm	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w	2 <w
	5	soil	0-10 cm	14 <t	100	81	87	100	76	67	55	91	110	12 <t	220	61	71	45	25	370	190
Blantyre School	6	soil	0-2 cm	5.5 <t	6 <t	23	92	130	110	95	85	120	140	16 <t	220	5.8 <t	87	16 <t	29	160	180
		sand	0-10 cm	2 <w	2 <w	2 <w	2.6 <t	3.7 <t	4.7 <t	4.9 <t	3.8 <t	3.5 <t	8 <t	2 <w	7 <t	2 <w	3.9 <t	3 <t	2 <w	8.4 <t	5.9 <t
Lucy Ave Park	7	soil	0-2 cm	5.6 <w	2 <w	27 <t	100	160	120	120	89	130	160	30	250	7.9 <t	100	11 <t	37	170	200
		sand	0-10 cm	2 <t	2 <w	9	110	180	190	160	150	200	210	25	250	2.2 <t	180	3.8 <t	42	75	200
Madelaine Ave Park	8	soil	0-2 cm	6.5 <t	76	75	220	360	220	250	250	270	340	31	730	38	240	47	81	870	780
Donora Park	9	soil	0-2 cm	3 <t	10 <t	15 <t	58	110	71	67	64	75	87	8.7 <t	150	5.4 <t	69	14 <t	27	110	130
Selwyn School	10	soil	0-2 cm	2 <w	2 <w	5 <t	18 <t	43	22	21	17 <t	24	28	2.5 <t	47	2.4 <t	17 <t	4 <t	4.6 <t	37	37
Ashbridges Bay	11	soil	0-2 cm	2 <w	2 <w	7 <t	27	49	29	27	23	31	40	3.5 <t	64	2 <w	28	4 <t	15 <t	42	57
Park (control)		sand	0-10 cm	2 <w	2 <w	2 <w	8 <t	11 <t	12 <t	12 <t	9.4 <t	12 <t	17 <t	2.4 <t	18 <t	2 <w	11 <t	2.9 <t	5 <t	12 <t	18 <t
Reg. 153/04 Table 1 Standards				70	80	160	740	490	470	ns	680	480	690	160	1100	120	380	90	ns	690	1000
Reg. 153/04 Table 2 Standards				15000	100000	28000	6600	1200	1200	ns	40000	12000	12000	1200	40000	340000	12000	4600	ns	40000	250000

ns - no standard, <t - a measureable trace amount, interpret with caution, <w - no measureable response
all results are in ng/g dry weight

Tabe B3: Dioxin and furan concentrations in soil collected in the vicinity of the Jones Auto Wrecker fire, Sept. 21-22, 2007

Location	Station	Type	Depth	1234678-heptachlorodioxin	123478-hexachlorodioxin	123678-hexachlorodioxin	123789-hexachlorodioxin	12378-pentachlorodioxin	2378-tetrachlorodioxin	Octachlorodioxin	1234678-heptachlorofuran	1234789-heptachlorofuran	123478-hexachlorofuran	123678-hexachlorofuran	123789-hexachlorofuran	12378-pentachlorofuran	234678-hexachlorofuran	23478-pentachlorofuran	2378-tetrachlorofuran	Octachlorofuran	WHO TEQ (1/2 MDL)
Dentonia Park	1	soil	0-2 cm	16	<0.7	1.4	<1.6	<0.74	<0.23	110	5.9	<0.74	1.9	<0.93	<0.4	<0.88	<0.98	<1	1.7	12	1.7
Kenworthy Ave Park	2	soil	0-2 cm	4.4	<0.57	<0.68	<0.68	<0.81	<0.2	28	1.8	<0.45	<0.64	<0.5	<0.43	<0.55	<0.52	<0.6	<0.62	<2.8	0.97
	3	sand	0-10cm	<0.53	<0.18	<0.17	<0.18	<0.28	<0.13	<3.4	<0.41	<0.17	<0.27	<0.13	<0.2	<0.21	<0.13	<0.22	<0.33	<0.73	0.35
	4	sand	0-10cm	<0.69	<0.16	<0.17	<0.17	<0.21	<0.11	4.8	<0.53	<0.16	<0.17	<0.11	<0.11	<0.24	<0.11	<0.28	<0.22	<0.74	0.3
	5	soil	0-10cm	4.6	<0.17	<0.24	<0.45	<0.51	<0.16	30	2.1	<0.3	<0.49	<0.31	<0.15	<0.41	<0.34	<0.41	1.2	<3.2	0.75
Blantyre School	6	soil	0-2 cm	<1.2	<0.18	<0.2	<0.19	<0.2	<0.07	6.4	<0.39	<0.14	<0.14	<0.09	<0.14	<0.24	<0.12	<0.17	<0.32	<0.83	0.26
		sand	0-10cm	26	<0.82	1.9	2.2	<0.97	<0.15	180	8.4	<0.74	1.6	1.4	<0.16	<0.68	1.3	<1.1	2	14	2.3
Lucy Ave Park	7	soil	0-2 cm	13	<0.53	<0.83	<1.1	<0.55	<0.13	110	3.4	<0.36	<0.6	<0.5	<0.22	<0.38	<0.37	<0.48	1.2	8.3	0.98
		sand	0-10cm	7.1	<0.24	<0.37	<0.74	<0.54	<0.08	56	<1.3	<0.25	<0.29	<0.23	<0.14	<0.19	<0.19	<0.28	<0.53	3.6	0.61
Madelaine Ave Park	8	soil	0-2 cm	11	<0.41	<0.7	<0.84	<0.36	<0.11	95	3.8	<0.35	<0.73	<0.55	<0.15	<0.41	<0.53	<0.49	1.2	4.9	0.84
Donora Park	9	soil	0-2 cm	14	<0.88	1.5	2.2	<0.79	<0.12	85	9.5	<0.51	1.4	1.2	<0.2	<0.53	1.1	<0.97	1.7	52	1.9
Selwyn School	10	soil	0-2 cm	4.7	<0.29	<0.36	<0.57	<0.27	<0.08	28	3.3	<0.39	<0.51	<0.33	<0.3	<0.33	<0.3	<0.32	<0.61	3.6	0.51
Ashbridges Bay Park	11	soil	0-2 cm	100	2.1	4.8	4.6	<1.7	<0.21	560	28	1.5	1.4	1.2	<0.16	<0.31	1.4	<0.62	<0.9	70	4.1
(control)		sand	0-10cm	270	8.3	13	16	5.5	<0.78	1300	62	3.7	2.9	2.7	<0.2	<0.44	2	<0.71	1.2	140	**14**
Reg. 153/04 Table 1				ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	7
Reg. 153/04 Table 2				ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	1000

< actual result is less than the reported value

- all results are in pg/g dry weight

Table B4: Metal in tree foliage from 7 schools and parks in the vicinity of the Jones Auto Wreckers Fire, Sept. 21-22, 2007

Location	Station	Type	Prep.	Al	Ba	B	Ca	Cu	Cr	Fe	Mg	Mn	Mo	Ni	Pb	Sr	Zn
Dentonia Park	1	maple	not washed	100	7.9	32	21000	3.9	0.7 <t	160	1600	25	0.2 <w	0.5 <w	0.6 <t	41	16
			washed	41	9.1	36	24000	3.9	0.5 <w	90	1800	37	0.2 <w	0.5 <w	0.6 <t	46	17
Kenworthy Ave Park	2	maple	not washed	71	9.8	140	22000	4.4	0.6 <t	200	1600	44	0.4 <t	0.5 <w	3.6	36	19
			washed	31	9.3	130	23000	4.1	0.5 <w	110	1600	44	0.4 <t	0.5 <w	1.4 <t	36	15
Blantyre School	6	ash	not washed	38	13	26	13000	11	0.5 <w	93	1700	14	0.4 <t	0.6 <t	0.5 <w	32	42
			washed	20 <t	13	30	15000	13	0.5 <w	66	1900	17	0.3 <t	0.6 <t	0.5 <w	36	37
Lucy Ave Park	7	maple	not washed	81	9.4	53	12000	9.4	1.3 <t	180	370	20	0.6 <t	0.6 <t	2.4 <t	26	33
			washed	46	7.9	49	12000	9.9	0.5 <w	120	290	17	0.5 <t	0.5 <w	0.7 <t	26	30
Madelaine Ave Park	8	maple	not washed	57	14	54	14000	3.7	0.5 <w	130	1100	49	0.2 <w	0.5 <w	0.7 <t	37	15
			washed	28	9.8	48	17000	4.2	0.5 <w	71	1100	38	0.2 <w	0.5 <w	0.5 <w	43	14
Donora Park	9	maple	not washed	44	3.8	22	13000	3.4	0.5 <w	84	1100	35	0.2 <w	0.5 <w	0.5 <w	25	8
			washed	23 <t	4.1	22	14000	5.1	0.5 <w	46	1100	46	0.2 <w	0.5 <w	0.5 <w	30	9
Selwyn School	10	maple	not washed	52	13	59	31000	4.7	1.0 <t	130	2100	93	0.4 <t	1.0 <t	1.0 <t	55	13
			washed	35	11	57	26000	5.3	1.0 <t	73	1800	89	0.4 <t	1.0 <t	1.0 <t	45	11
Ashbridges Bay Park	11	maple	not washed	75	14	56	26000	3.9	1.0 <t	150	2000	30	0.4 <t	1.0 <t	1.0 <t	68	18
(control)			washed	30	13	58	26000	3.8	1.0 <t	74	2100	30	0.4 <t	1.0 <t	1.0 <t	70	18
ULN Guideline				500	ng	175	ng	20	8.0	1000	7000	100	1.5	7.0	60*	ng	250

<t - a measureable trace amount, interpret with caution, <w - no measureable response, all results are in µg/g dry weight

* - lead ULN was developed from data dating to when leaded gasoline was still in use.

- all the results for Be, Cd, Co and V were below the analytical detection limit

Table B5: PAHs in tree foliage in the vicinity of the Jones Auto Wrecker Fire on Sept. 21-22, 2007

Parameter	Site 1	Site 2	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11
Napthalene	20 <w	20 <w	20 <w	20 <w	20 <w	20 <w	20 <w	20 <w
Acenapthylene	20 <w	72 <t	20 <w	31 <t	20 <w	20 <w	20 <w	20 <w
Acenapthene	20 <w	20 <w	20 <w	20 <w	20 <w	20 <w	20 <w	20 <w
Fluorene	20 <w	88 <t	20 <w	40 <t	20 <w	20 <w	20 <w	20 <w
Phenantrene	26 <t	490	20 <w	520	130	20 <w	21 <t	20 <w
Anthracene	20 <w	130	20 <w	72 <t	20 <w	20 <w	20 <w	20 <w
Fluoranthene	21 <t	170	20 <w	230	87 <t	20 <w	20 <w	20 <w
Pyrene	20 <w	120	20 <w	180	59 <t	20 <w	20 <w	20 <w
Benzo(a)anthracene	20 <w	20 <w	20 <w	64 <t	20 <w	20 <w	20 <w	20 <w
Chrysene	20 <w	20 <w	20 <w	100	20 <w	20 <w	20 <w	20 <w
Benzo(b)fluoranthene	20 <w	20 <w	20 <w	41 <t	20 <w	20 <w	20 <w	20 <w
Benzo(k)fluoranthen	20 <w	20 <w	20 <w	52 <t	20 <w	20 <w	20 <w	20 <w
Benzo(a)pyrene	40 <w	40 <w	40 <w	40 <w	40 <w	40 <w	40 <w	40 <w
Indo(1,2,3-c,d)pyrene	40 <w	40 <w	40 <w	55 <t	40 <w	40 <w	40 <w	40 <w
Dibenzo(a,h)anthracene	40 <w	40 <w	40 <w	46 <t	40 <w	40 <w	40 <w	40 <w
Benzo(g,h,i)perylene	40 <w	40 <w	40 <w	40 <w	40 <w	40 <w	40 <w	40 <w

<t - a measureable trace amount, interpret with caution, <w - no measureable response

- all results are in ng/g wet weight

Table B6: Dioxins in tree foliage from 7 parks and schools in the vicinity of the Jones Auto Wreckers fire, Sept. 21-22, 2007

Location	Station	Type	2378-tetrachlorodioxin	12378-pentachlorodioxin	123478-hexachlorodioxin	123678-hexachlorodioxin	123789-hexachlorodioxin	1234678-heptachlorodioxin	Octachlorodioxin	2378-tetrachlorofuran	12378-pentachlorofuran	23478-pentachlorofuran	123478-hexachlorofuran	123678-hexachlorofuran	234678-hexachlorofuran	123789-hexachlorofuran	1234678-heptachlorofuran	1234789-heptachlorofuran	Octachlorofuran	TEQ WHO (1/2 MDL)
Dentonia Park	1	maple	<0.15	<0.3	<0.13	<0.13	<0.16	<0.56	4.0	<0.6	<0.19	<0.15	<0.16	<0.11	<0.1	<0.12	<0.27	<0.084	<0.2	0.35
Kenworthy Ave Park	2	maple	<0.11	<0.29	<0.15	<0.16	<0.16	<0.88	5.0	1.5	<0.15	<0.19	<0.13	<0.083	<0.087	<0.1	<0.32	<0.081	0.55	0.45
Blantyre School	6	ash	<0.12	<0.29	<0.14	<0.13	<0.14	<0.54	2.3	<0.43	<0.15	<0.15	<0.11	<0.12	<0.1	<0.1	<0.3	<0.1	<0.2	0.32
Lucy Ave Park	7	maple	<0.17	<0.37	<0.15	<0.15	<0.16	1.0	3.9	4.5	<0.65	1.0	0.7	0.62	0.5	<0.13	1.4	0.34	1.1	1.5
Madelaine Ave Park	8	maple	<0.13	<0.32	<0.12	<0.12	<0.13	<0.55	2.5	1.1	<0.11	<0.25	<0.19	<0.14	<0.08	<0.087	<0.28	<0.094	<0.23	0.44
Donora Park	9	maple	<0.12	<0.32	<0.11	<0.078	<0.081	<0.47	1.7	<0.63	<0.1	<0.15	<0.11	<0.11	<0.066	<0.068	<0.21	<0.076	<0.21	0.33
Selwyn School	10	maple	<0.11	<0.13	<0.073	<0.074	<0.078	<0.47	1.9	<0.57	<0.14	<0.15	<0.061	<0.06	<0.08	<0.067	<0.21	<0.08	<0.15	0.22
Ashbridges Bay Park	11	maple	<0.12	<0.21	<0.11	<0.18	<0.26	2.2	10	<0.37	<0.14	<0.14	<0.17	<0.1	<0.1	<0.074	<0.66	<0.06	0.99	0.3

< actual results are less than the reported value.
all results are in ng/g wet weight

Appendix C: Sampling Location Coordinates and Photos

Table C1: Sampling location coordinates for soil and vegetation sampling.

Site	Station	Zone	Easting	Northing	Latitude	Longitude	± Error (m)	Altitude (m)	Date	Time
1	3328001	17	637637	4839315	43.694096	-79.292041	1.5	126	21-Sep-07	11:19
2	3328002	17	638316	4838939	43.690584	-79.283714	2.0	135	21-Sep-07	12:50
3	3328003	17	638343	4838944	43.690629	-79.283379	1.7	136	21-Sep-07	13:01
4	3328004	17	638346	4838934	43.690530	-79.283340	2.7	134	21-Sep-07	13:16
5	3328005	17	638316	4838944	43.690634	-79.283711	2.1	131	21-Sep-07	13:36
6	3328006	17	638255	4838342	43.685224	-79.284616	1.7	127	21-Sep-07	15:22
7	3328007	17	638164	4838968	43.690871	-79.285584	1.8	127	21-Sep-07	17:01
8	3328008	17	638231	4839193	43.692884	-79.284703	1.9	128	22-Sep-07	8:38
9	3328009	17	637288	4839951	43.699887	-79.296200	1.6	126	22-Sep-07	9:25
10	3328010	17	636501	4840955	43.709063	-79.305708	2.0	128	22-Sep-07	10:24
11	3328011	17	636229	4835516	43.660168	-79.310460	1.7	77	22-Sep-07	11:43

Figure C1: Site 1, Dentonia Park soccer field looking north.

Figure C2: Site 1, Dentonia Park soccer field looking west.

Figure C3: Site 2, Kenworthy Ave. Park, soil and maple sample location, looking west.

Figure C4: Site 2, Kenworthy Ave. Park, soil and maple sample location, looking north.

Figure C5: Site 3, Kenworthy Ave. Park, fire water flooded play sand area, looking east.

Figure C6: Site 3, Kenworthy Ave. Park, fire water flooded play sand area, looking north.

Figure C7: Site 4, Kenworthy Ave. Park, not flooded play sand area, looking north.

Figure C8: Site 4, Kenworthy Ave. Park, not flooded play sand area, looking east.

Figure C8: Site 5, Kenworthy Ave. Park, fire water flooded grass area, looking west.

Figure C9: Site 5, Kenworthy Ave. Park, fire water flooded grass area, looking north.

Figure C10: Site 6, Blantyre School, soccer field grass area and ash tree, looking north.

Figure C11: Site 6, Blantyre School, soccer field grass area, looking east.

Figure C12: Site 6, Blantyre School, play ground play sand area, looking east.

Figure C13: Site 6, Blantyre School, play ground play sand area, looking north.

Figure C14: Site 7, Lucy Ave. Park, play ground play sand area, looking north.

Figure C15: Site 7, Lucy Ave. Park, play ground play sand area, looking southwest.

Figure C16: Site 7, Lucy Ave. Park, grassed soil sample area, looking west.

Figure C17: Site 7, Lucy Ave. Park, grassed soil sample area, looking north.

Figure C18: Site 8, Madelaine Ave. Park, grassed soil sample area, looking east.

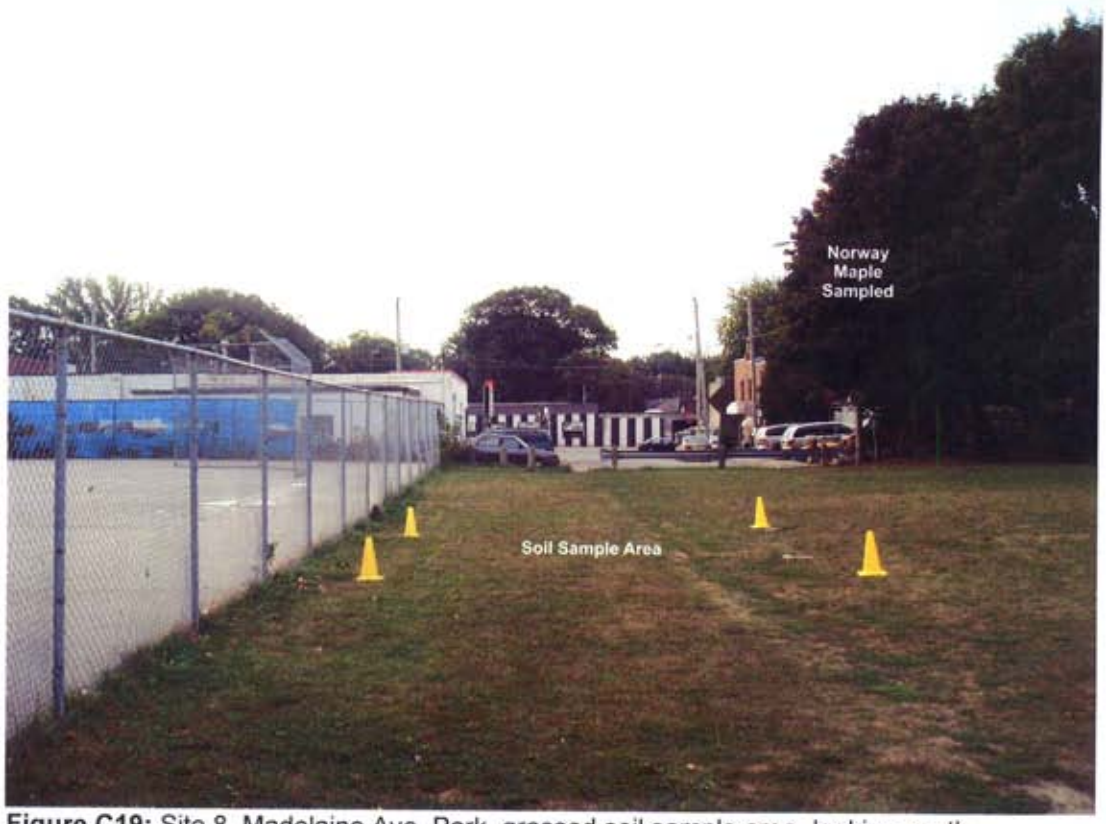

Figure C19: Site 8, Madelaine Ave. Park, grassed soil sample area, looking south.

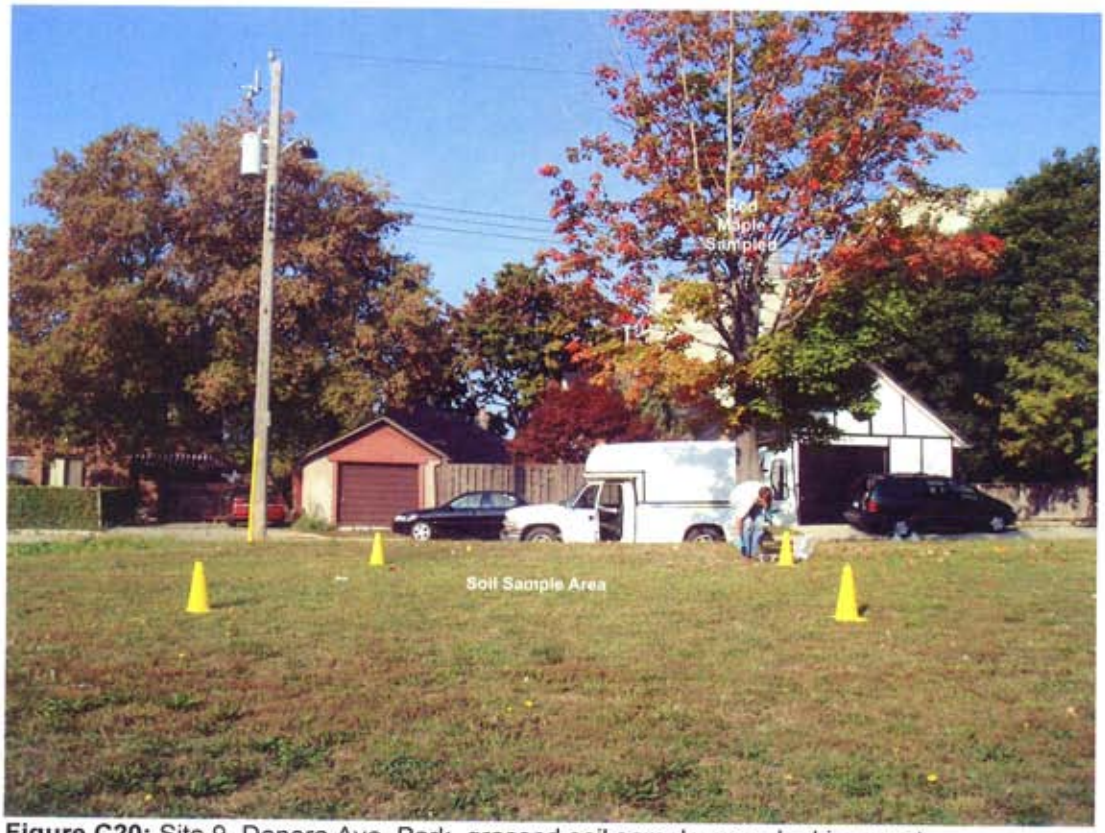

Figure C20: Site 9, Donora Ave. Park, grassed soil sample area, looking west.

Figure C21: Site 9, Donora Ave. Park, grassed soil sample area, looking north.

Figure C22: Site 10, Selwyn School, grassed soil sample area, looking north.

Figure C23: Site 10, Selwyn School, grassed soil sample area, looking east.

Figure C24: Site 11, Ashbridges Bay Park control, grassed soil sample area, looking north.

Figure C25: Site 11, Ashbridges Bay Park control, grassed soil sample area, looking south.

Figure C24: Site 11, Ashbridges Bay Park control, sand sample area, looking south.

Appendix D: Derivation/Significance of the Ontario Ministry of the Environment (MOE) "Ontario Typical Range" Soil Guidelines

The MOE "Ontario Typical Range" (OTR) guidelines are being developed to assist in interpreting analytical data and evaluating source-related impacts on the terrestrial environment. The OTRs are used to determine if the level of a chemical parameter in soil, plants, moss bags, or snow is significantly greater than the normal background range. An exceedence of the OTR_{98} (the OTR_{98} is the actual guideline number) may indicate the presence of a potential point source of contamination.

The OTR_{98} represents the expected range of concentrations of chemical parameters in surface soil, plants, moss bags, and snow from areas in Ontario not subjected to the influence of known point sources of pollution. The OTR_{98} represents 97.5 percent of the data in the OTR distribution. This is equivalent to the mean plus two standard deviations, which is similar to the previous MOE "Upper Limit of Normal" (ULN) guidelines. In other words, 98 out of every 100 background samples should be lower than the OTR_{98}.

The OTR_{98} may vary between land use categories even in the absence of a point source of pollution because of natural variation and the amount and type of human activity, both past and present. Therefore, OTRs are being developed for several land use categories. The three main land use categories are Rural, New Urban, and Old Urban. Urban is defined as an area that has municipal water and sewage services. Old Urban is any area that has been developed as an urban area for more than 40 years. Rural is all other areas. These major land use categories are further broken into three subcategories; Parkland (which includes greenbelts and woodlands), Residential, and Industrial (which includes heavy industry, commercial properties such as malls, and transportation rights-of-way). Rural also includes an Agricultural category.

The OTR guidelines apply only to samples collected using standard MOE sampling, sample preparation, and analytical protocols. Because the background data were collected in Ontario, the OTRs represent Ontario environmental conditions.

The OTRs are not the only means by which results are interpreted. Data interpretation should involve reviewing results from control samples, examining all the survey data for evidence of a pattern of contamination relative to the suspected source, and where available, comparison with effects-based guidelines. The OTRs are particularly useful where there is uncertainty regarding local background concentrations and/or insufficient samples were collected to determine a contamination gradient. OTRs are also used to determine where in the anticipated range a result falls. This can identify a potential concern even when a result falls within the guideline. For example, if all of the results from a survey are close to the OTR_{98} this could indicate that the local environment has been contaminated above the anticipated average, and therefore the pollution source should be more closely monitored.

The OTRs identify a range of chemical parameters resulting from natural variation and normal human activity. As a result, it must be stressed that values falling within a specific OTR98 should not be considered as acceptable or desirable levels; nor does the OTR_{98} imply toxicity to plants, animals or humans. Rather, the OTR_{98} is a level which, if exceeded, prompts further investigation on a case by case basis to determine the significance, if any, of the above normal concentration. Incidental, isolated or spurious exceedences of an OTR_{98} do not necessarily

indicate a need for regulatory or abatement activity. However, repeated and/or extensive exceedences of an OTR_{98} that appears to be related to a potential pollution source does indicate the need for a thorough evaluation of the regulatory or abatement program.

The OTR_{98} supersedes the Phytotoxicology ULN guideline. The OTR program is on-going. The number of OTRs will be continuously updated as sampling is completed for the various land use categories and sample types. For more information on these guidelines please refer to Ontario Typical Range of Chemical Parameters in Soil, Vegetation, Moss Bags, and Snow, MOEE Report Number HCB-151-3512-93, PIBs Number 2792, ISBN 0-778-1979-1.

Appendix E: Ontario Regulation 153/04 Soil, Ground Water, and Sediment Standards

The Ministry's soil, ground water, and sediment standards are for use under *Part XV.1* of the *Environmental Protection Act* and are referred to in the *Record of Site Condition Ontario Regulation 153/04*. In 1996 the Ministry published the *Guideline for Use at Contaminated Sites in Ontario*, which provided industrial property owners and their consultants with guidance in identifying and cleaning up contaminated soil on their property. As of October 1, 2004 the site assessment and remediation of properties for which a Record of Site Condition is filed will need to conform to the requirements set out in *O. Reg 153/04*.

The standards set out in *O. Reg 153/04* were developed from published U.S. EPA and Ontario environmental data bases. Currently there are criteria for about 25 inorganic elements and about 90 organic compounds. Criteria were developed only if there were sufficient, defendable, effects-based data on the potential to cause an adverse effect to human health or the natural environment. In setting the *O. Reg 153/04* standards, the Ministry reviewed the international literature and Ontario environmental data and determined the lowest concentration that may cause an adverse effect to the natural environment and the lowest concentration that may have an adverse human health effect and set the standard at whichever value was lower. By setting the standard to protect the most sensitive environmental receptor all other biological receptors, both human and the natural environment, should be protected by default. In cases where the criteria to protect human health or the natural environment are lower than natural background levels, then the *O. Reg 153/04* standard is set at background. The development of these standards is a continuous program, and criteria for more elements and compounds will be developed as additional environmental data become available. Similarly, new information could result in modifications to the existing standards.

O. Reg. 153/04 standards are not action levels, in that an exceedence does not automatically mean that a clean-up must be conducted. The criteria were prepared to help industrial property owners clean-up contamination on their property when the land is intended to be sold, the zoning changed, and/or the property redeveloped to a more sensitive land-use. For example, the owner of an industrial property that plans to sell the land to a developer to build residential housing must meet the criteria set out in *O. Reg. 153/04* in order to obtain a Record of Site Condition, which is an acknowledgement by the Ministry that they have met Ministry environmental standards. In this way previously-contaminated industrial land can be safely re-developed for residential or parkland use without concern for adverse environmental or human health effects. In addition, most municipalities insist that contaminated land is cleaned up according to *O. Reg 153/04* before they will approve a zoning change, therefore industrial property owners and developers are obliged to comply with the Regulation.

O. Reg. 153/04 contains a series of Tables (1 through 6), each having criteria for soil, sediment, and ground water for various land-use categories (eg, agricultural, residential, industrial). *Table 1* criteria reflect the upper range of background concentrations in Ontario. An exceedence of *Table 1* indicates the likely presence of a contaminant source. *Tables 2* through *5* criteria are effects-based and relate to potable or non-potable ground water conditions. The criteria in *Tables 2* through *5* take into consideration the potential for adverse effects from exposure to contaminated media through ingestion and direct contact, through contaminant transfer from soil to indoor air, from ground water or surface water through release of volatile gases, from leaching of contaminants in soil to ground water, and from ground water discharge to surface water.

However, the criteria *may not* ensure that corrosive, explosive, or unstable soil conditions will be eliminated. *Table 6* is used to determine if the property qualifies as a "shallow soil" property, which places additional restrictions on the site under Section 41 of *O. Reg 153/04*.

Although written specifically to assist industrial landowners in the sale and redevelopment of their own contaminated site, the environmental standards in *O. Reg. 153/04* are becoming used more widely to interpret soil, sediment, and ground water quality at the community or even the landscape scale. When used in this manner, an exceedence of the *O. Reg 153/04* criteria do not imply that remediation is required, rather it suggests that additional studies are warranted. These additional studies may involve more environmental sampling, an ecological or a human health risk assessment, or even a health study. Decisions on the need to undertake any additional studies when the criteria in *O. Reg. 153/04* are exceeded are made on a site by site basis and are usually contingent on the contaminants having the demonstrated likelihood to cause an adverse effect to the natural environment or human health.

Because of society's long industrial history and our practice of living close to our work place the soil in many communities in Ontario may be contaminated above the effects-based criteria in *O. Reg 153/04*. In practice, remediation of contaminated soil on privately-owned residential property and public green spaces has only been conducted in communities when the potential for adverse health effects has been demonstrated.

For more information on the rationale for the Ministry's soil, sediment, and ground water criteria in *O. Reg 153/04* please refer to the *Rationale for the Development and Application of Generic Soil, Ground Water and Sediment Criteria for Use at Contaminated Sites in Ontario (December 1996).*

Appendix F: Derivation/Significance of the Ontario Ministry of the Environment (MOE) "Upper Limits of Normal" Contaminant Guidelines for Phytotoxicology Samples

The MOE Upper Limits of Normal (ULN) contaminant guidelines represent the expected maximum concentration in foliage (trees and shrubs), grass, moss bags, and snow from areas in Ontario not exposed to the influence of a pollution source. Urban ULN guidelines are based on samples collected from urban centres, whereas rural ULN guidelines were developed from non-urbanized areas. Samples were collected by Phytotoxicology staff using standard sampling procedures (reference: *Ontario Ministry of the Environment. 1989. Ontario Ministry of the Environment "Upper Limit of Normal" Contaminant Guidelines for Phytotoxicology Samples. Phytotoxicology Section, Air Resources Branch: Technical Support Sections NE and NW Regions, Report No. ARB-138-88-Phyto. ISBN: 0-7729-5143-8.*). Chemical analyses were conducted by the MOE Laboratory Services Branch.

The ULN is the arithmetic mean plus three standard deviations of the suitable background data for each chemical element and parameter. This represents 99% of the sample population. This means that for every 100 samples that have not been exposed to a pollution source, 99 will fall within the ULN.

The ULNs do not represent maximum desirable or allowable limits. Rather, they are an indication that concentrations that exceed the ULN may be the result of contamination from a pollution source. Concentrations that exceed the ULNs are not necessarily toxic to plants, animals, or people. Concentrations that are below the ULNs are not known to be toxic.

ULNs are not available for all elements. This is because some elements have a very large range in the natural environment and the ULN, calculated as the mean plus three standard deviations, would be unrealistically high. Also, for some elements, insufficient background data is available to confidently calculate ULNs. The MOE Phytotoxicology ULNs are no longer being maintained. The Ontario Typical Range (OTR) have been developed to replace the ULN guidelines and supercede any ULN guidelines. Where OTR values have not been developed to date, i.e. for vegetation, moss bag and snow samples, the ULN guidelines can still be used.